

# 4

# Function Families for 2000, Alex

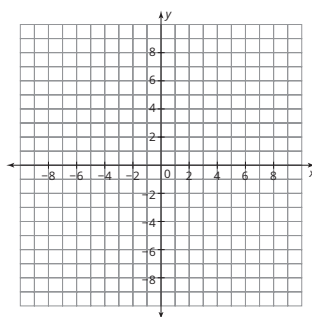
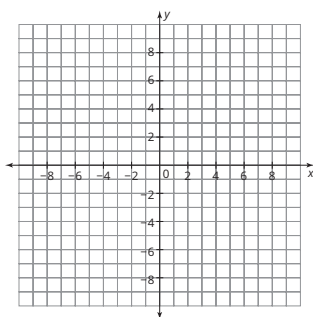
Recognizing Functions by Characteristics

## Warm Up

1. Sketch a graph and write an equation for each function.

a. decreasing linear function

b. increasing exponential function



## Learning Goals

- Recognize similar characteristics among function families.
- Recognize different characteristics among function families.
- Determine function types given certain characteristics.

You have identified key characteristics of graphs. How can the key characteristics help you sketch the graph of a function?

## Name That Function!

You have sorted graphs according to their function family. Now, consider which function families have the given characteristics.

### Function Families

linear

exponential

quadratic

linear absolute value

- 1. Which function families can be described by the characteristic provided? Choose from the given list.**
  - a. The graph is a smooth curve.**
  - b. The graph is made up of one or more straight lines.**
  - c. The graph increases or decreases over the entire domain.**
  - d. The graph has an absolute maximum or minimum.**
  
- 2. One or more characteristics have been added to the graphical description of each function. Name the possible function families.**
  - a. The graph has an absolute minimum or absolute maximum and is a smooth curve.**
  - b. The graph either increases or decreases over the entire domain and is a straight line.**
  - c. The graph is a smooth curve, and either increases or decreases over the entire domain.**
  - d. The graph has either an absolute minimum or an absolute maximum, has symmetry, and is made up of 2 straight lines.**

Each function family has certain graphical behaviors, with some behaviors common among different function families. Notice, the more specific characteristics that are given, the more specifically you can name that function!

## Categorizing Scenarios into Their Function Families



You have been introduced to several function families: linear, exponential, quadratic, and linear absolute value. Let's revisit the first lesson: *A Picture Is Worth a Thousand Words*. Each of the scenarios in that lesson represents one of these function families.

**1. Describe how each scenario represents a function.**

**2. Complete the table on the following pages to describe each scenario.**

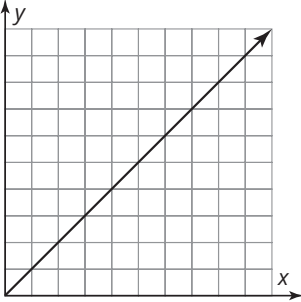
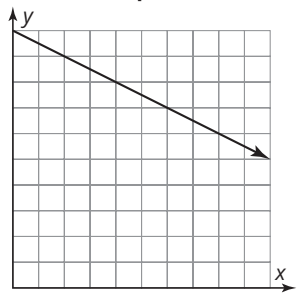
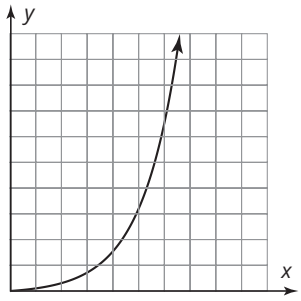
**a. Identify the appropriate function family under the scenario name.**

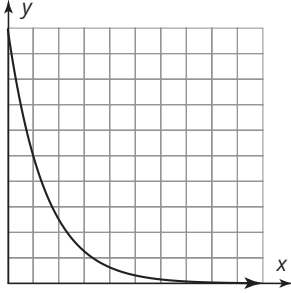
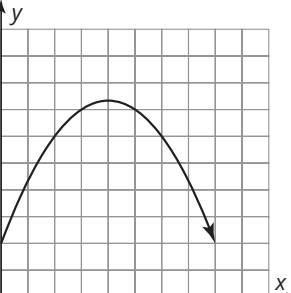
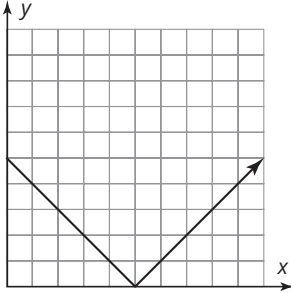
**b. Based on the context, identify the domain.**

**c. Describe the graphical behavior as increasing, decreasing, constant, or a combination.**

### Remember:

Each of the graphs representing the scenarios was drawn with either a continuous line or a continuous smooth curve to model the problem situation.

Scenario	Domain of the Real-World Situation	Graph of the Mathematical Model	Graphical Behavior
Music Club		<p style="text-align: center;"><b>Graph E</b></p> 	
Something's Fishy		<p style="text-align: center;"><b>Graph A</b></p> 	
Smart Phone, but Is It a Smart Deal?		<p style="text-align: center;"><b>Graph B</b></p> 	

Scenario	Domain of the Real-World Situation	Graph of the Mathematical Model	Graphical Behavior
It's Magic		<p style="text-align: center;"><b>Graph D</b></p> 	
Baton Twirling		<p style="text-align: center;"><b>Graph F</b></p> 	
Jelly Bean Challenge		<p style="text-align: center;"><b>Graph C</b></p> 	





In this activity, you will write equations and sketch a graph based on given characteristics.

1. Use the given characteristics to create an equation and sketch a graph. Use the equations given in the box as a guide. When creating your equation, use  $a$ ,  $b$ , and  $c$  values that are any real numbers between  $-3$  and  $3$ . Do not use any functions that were used previously in this topic.

**Linear Function**

$$f(x) = ax + b$$

**Exponential Function**

$$f(x) = a \cdot b^x + c$$

**Quadratic Function**

$$f(x) = ax^2 + bx + c$$

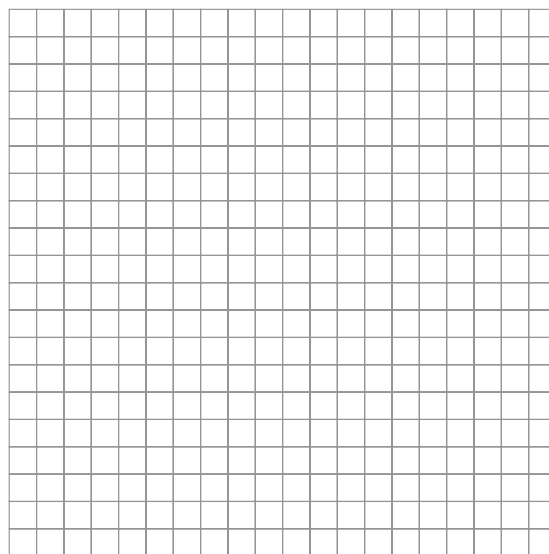
**Linear Absolute Value Function**

$$f(x) = a|x + b| + c$$

- a. Create an equation and sketch a graph that is:

- a function,
- exponential,
- continuous, and
- decreasing.

Equation: \_\_\_\_\_


**Think**

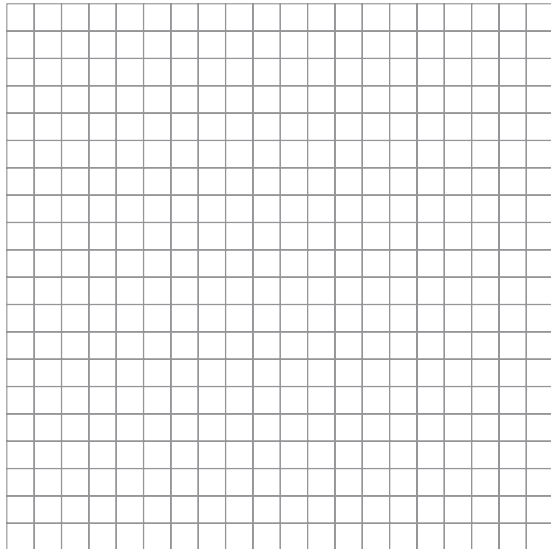
about:

Don't forget about the function family graphic organizers you created if you need some help.

**b. Create an equation and sketch a graph that:**

- has a minimum,
- is discrete, and
- is a linear absolute value function.

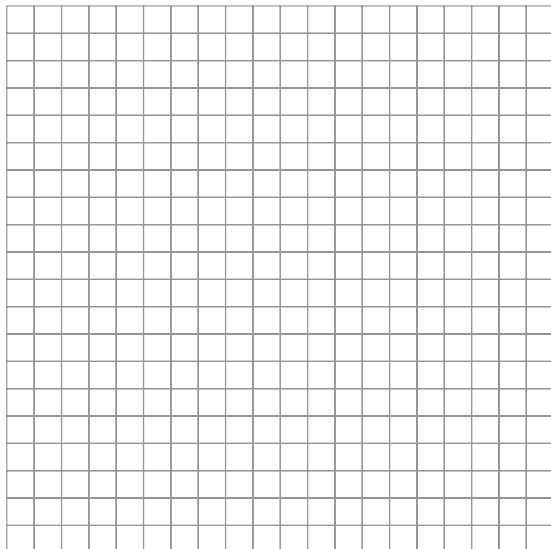
Equation: \_\_\_\_\_



**c. Create an equation and sketch a graph that is:**

- linear,
- discrete,
- increasing, and
- a function.

Equation: \_\_\_\_\_



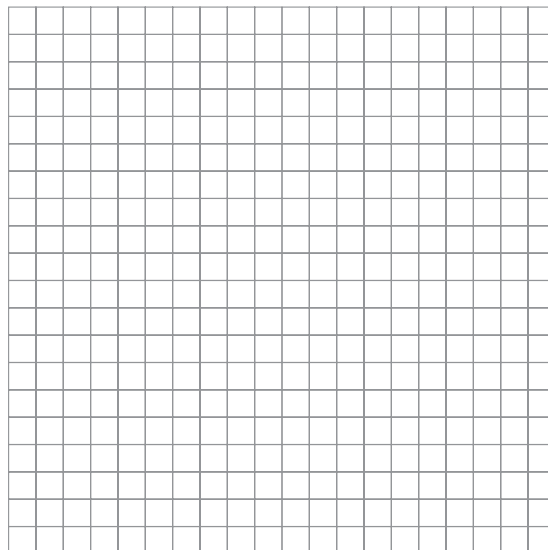
• yourself:

Is the domain the same or different for each function?

**d. Create an equation and sketch a graph that:**

- is continuous,
- has a maximum,
- is a function, and
- is quadratic.

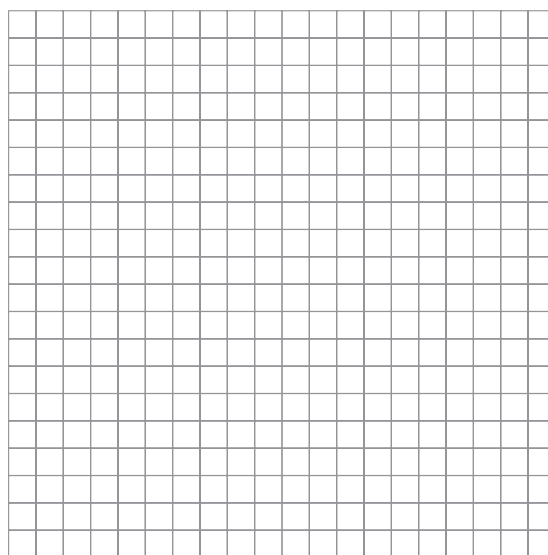
Equation: \_\_\_\_\_



**e. Create an equation and sketch a graph that is:**

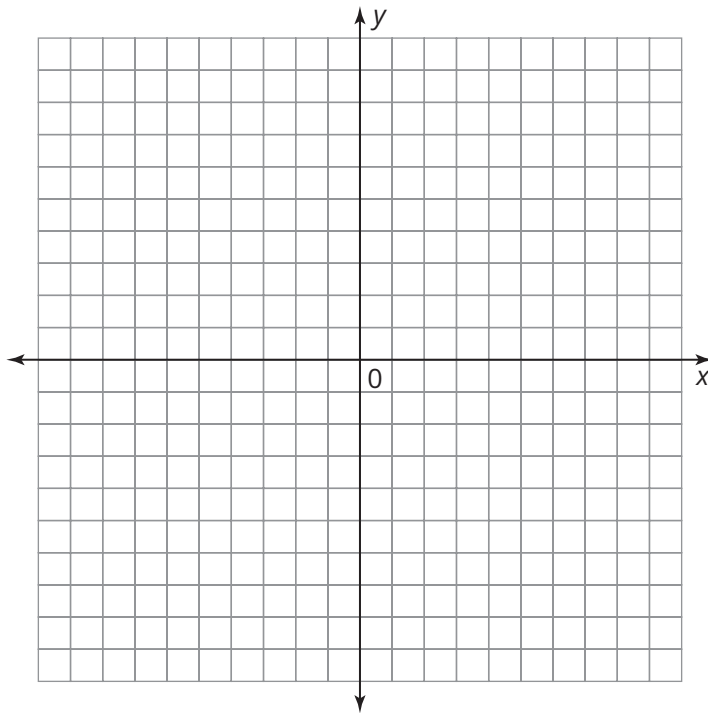
- not a function,
- continuous, and
- a straight line

Equation: \_\_\_\_\_





2. Create your own function. Describe certain characteristics of the function and see if your partner can sketch it. Then sketch your partner's function based on characteristics provided.



## TALK the TALK

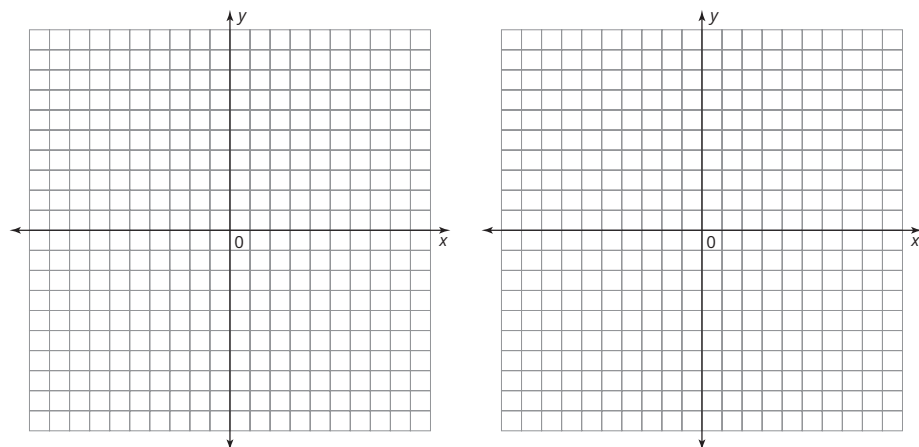
### Trying to Be Unique

Throughout this lesson, you used characteristics to describe graphs.

#### 1. Write a list of four characteristics to describe a graph.

- \_\_\_\_\_  
\_\_\_\_\_
- \_\_\_\_\_  
\_\_\_\_\_
- \_\_\_\_\_  
\_\_\_\_\_
- \_\_\_\_\_  
\_\_\_\_\_

#### 2. Sketch two possible graphs based on your characteristics.



#### 3. How could you modify your list of characteristics to describe a unique graph?